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APPLICATION FOR LETTERS PATENT

**User Interface for Creating, Viewing, and Temporally
Positioning Annotations for Media Content**

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7 **RELATED APPLICATIONS**

8 This application claims priority to U.S. Provisional Application No.
9 60/100,452, filed September 15, 1998, entitled "Annotations for Streaming Video
10 on the Web: System Design and Usage", to Anoop Gupta and David M. Bargerion.
11

12 **TECHNICAL FIELD**

13 This invention relates to networked client/server systems and to annotating
14 media content in such systems. More particularly, the invention relates to
15 creating, viewing, and temporally positioning annotations for media content.
16

17 **BACKGROUND OF THE INVENTION**

18 The advent of computers and their continued technological advancement
19 has revolutionized the manner in which people work and live. An example of
20 such is in the education field, wherein educational presentations (e.g., college
21 lectures, workplace training sessions, etc.) can be provided to a computer user as
22 multimedia data (e.g., video, audio, text, and/or animation data). Today, such
23 presentations are primarily video and audio, but a richer, broader digital media era
24 is emerging. Educational multimedia presentations provide many benefits, such as
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1 allowing the presentation data to be created at a single time yet be presented to
2 different users at different times and in different locations throughout the world.

3 These multimedia presentations are provided to a user as synchronized
4 media. Synchronized media means multiple media objects that share a common
5 timeline. Video and audio are examples of synchronized media—each is a
6 separate data stream with its own data structure, but the two data streams are
7 played back in synchronization with each other. Virtually any media type can
8 have a timeline. For example, an image object can change like an animated .gif
9 file, text can change and move, and animation and digital effects can happen over
10 time. This concept of synchronizing multiple media types is gaining greater
11 meaning and currency with the emergence of more sophisticated media
12 composition frameworks implied by MPEG-4, Dynamic HTML, and other media
13 playback environments.

14 The term “streaming” is used to indicate that the data representing the
15 various media types is provided over a network to a client computer on a real-
16 time, as-needed basis, rather than being pre-delivered in its entirety before
17 playback. Thus, the client computer renders streaming data as it is received from a
18 network server, rather than waiting for an entire “file” to be delivered.

19 Multimedia presentations may also include “annotations” relating to the
20 multimedia presentation. An annotation is data (e.g., audio, text, video, etc.) that
21 corresponds to a multimedia presentation. Annotations can be added by anyone
22 with appropriate access rights to the annotation system (e.g., the lecturer/trainer or
23 any of the students/trainees). These annotations typically correspond to a
24 particular temporal location in the multimedia presentation and can provide a
25 replacement for much of the “in-person” interaction and “classroom discussion”

1 that is lost when the presentation is not made "in-person" or "live". As part of an
2 annotation, a student can comment on a particular point, to which another student
3 (or lecturer) can respond in a subsequent annotation. This process can continue,
4 allowing a "classroom discussion" to occur via these annotations.

5 In the past, there has been little development of a coherent interface to
6 ensure a high-quality user experience in creating and viewing annotations. The
7 invention described below addresses the user experience by providing a user-
8 friendly interface for creating and viewing annotations for multimedia
9 presentations.

10 11 **SUMMARY OF THE INVENTION**

12 In a networked client/server system, media content as well as annotations
13 corresponding to the media content can be transmitted from a server(s) to a client.
14 A user interface is presented to the user to facilitate creating new annotations and
15 viewing annotations.

16 According to one aspect of the invention, annotations correspond to a
17 temporal range of the media content as defined by a temporal beginning point and
18 a temporal ending point. When a user desires to create a new annotation the client
19 assists the user in determining the temporal range of the media content to which
20 the new annotation is to correspond. The client receives the user request to create
21 the new annotation, which often times is made after the desired temporal
22 beginning point for the new annotation has passed. The client analyzes the media
23 content and detects likely beginning points for the new annotation and identifies
24 these beginning points to the user. The user can then select one as the beginning
25

1 point for the new annotation. Analogous assistance can be provided in
2 determining the ending point for the new annotation.

3 According to another aspect of the invention, the user interface includes
4 implicit information for use in creating and/or viewing annotations. For example,
5 in one implementation annotations can belong to one or more different annotation
6 sets. The user interface can be associated with selected ones of these different
7 annotation sets, so that any newly created annotations automatically belong to that
8 set, or annotation queries automatically query that set, without requiring the user
9 to specify the set.

10 According to another aspect of the invention, the user interface includes
11 multiple user-configurable buttons. The user can assign various actions to these
12 buttons, such as the creation of new annotations with pre-identified subject lines,
13 pre-defined content, pre-defined association with particular annotation sets, etc.

14 **BRIEF DESCRIPTION OF THE DRAWINGS**

15 The present invention is illustrated by way of example and not limitation in
16 the figures of the accompanying drawings. The same numbers are used
17 throughout the figures to reference like components and/or features.

18 Fig. 1 shows a client/server network system and environment in accordance
19 with the invention.

20 Fig. 2 shows a general example of a computer that can be used as a client or
21 server in accordance with the invention.

22 Fig. 3 illustrates an exemplary annotation server and client computer in
23 more detail.
24
25

1 Fig. 4 shows an exemplary structure for an annotation entry that is
2 maintained by the annotation server of Fig. 3.

3 Fig. 5 is a flowchart illustrating an exemplary process for assisting a user in
4 determining a starting point for an annotation.

5 Fig. 6 illustrates an annotation toolbar in accordance with one embodiment
6 of the invention.

7 Figs. 7, 8, 9, 10, and 11 illustrate exemplary dialog boxes for creating new
8 annotations.

9 Figs. 12, 13, and 14 illustrate exemplary dialog boxes for querying
10 annotations.

11 Figs. 15, 16, 17, and 18 illustrate exemplary dialog boxes for viewing
12 annotations.

13 Fig. 19 illustrates an exemplary dialog box for reply to an annotation.

14 Fig. 20 illustrates another exemplary dialog box for viewing an annotation.

15 Fig. 21 illustrates an exemplary dialog box for editing annotations.

16 Figs. 22 and 23 illustrate exemplary graphical user interface windows that
17 concurrently display annotations and corresponding multimedia content.

18 Figs. 24, 25, and 26 illustrate exemplary customized graphical user
19 interface windows.

20 21 **DETAILED DESCRIPTION**

22 **General Network Structure**

23 Fig. 1 shows a client/server network system and environment in accordance
24 with the invention. Generally, the system includes multiple network server
25 computers 10, 11, 12, and 13, and multiple (n) network client computers 15. The

1 computers communicate with each other over a data communications network.
2 The communications network in Fig. 1 comprises a public network 16 such as the
3 Internet. The data communications network might also include, either in addition
4 to or in place of the Internet, local-area networks and/or private wide-area
5 networks.

6 Streaming media server computer 11 has access to streaming media content
7 in the form of different media streams. These media streams can be individual
8 media streams (e.g., audio, video, graphical, etc.), or alternatively composite
9 media streams including two or more of such individual streams. Some media
10 streams might be stored as files in a database or other file storage system, while
11 other media streams might be supplied to the server on a "live" basis from other
12 data source components through dedicated communications channels or through
13 the Internet itself. Different versions of the same media content (e.g., low-
14 resolution and high-resolution versions) may be available to server computer 11.

15 There are various standards for streaming media content and composite
16 media streams. "Advanced Streaming Format" (ASF) is an example of such a
17 standard, including both accepted versions of the standard and proposed standards
18 for future adoption. ASF specifies the way in which multimedia content is stored,
19 streamed, and presented by the tools, servers, and clients of various multimedia
20 vendors. Further details about ASF are available from Microsoft Corporation of
21 Redmond, Washington.

22 Annotation server 10 controls the storage of annotations and their provision
23 to client computers 15. The annotation server 10 manages the annotation meta
24 data store 18 and the annotation content store 17. The annotation server 10
25 communicates with the client computers 15 via any of a wide variety of known

1 protocols, such as the Hypertext Transfer Protocol (HTTP). The annotation server
2 10 can receive and provide annotations via direct contact with a client computer
3 15, or alternatively via electronic mail (email) via email server 13. The annotation
4 server 10 similarly communicates with the email server 13 via any of a wide
5 variety of known protocols, such as the Simple Mail Transfer Protocol (SMTP).

6 The annotations managed by annotation server 10 correspond to the
7 streaming media available from media server computer 11. In the discussions to
8 follow, the annotations are discussed as corresponding to streaming media.
9 However, it should be noted that the annotations can similarly correspond to "pre-
10 delivered" rather than streaming media, such as media previously stored at the
11 client computers 15 via the network 16, via removable magnetic or optical disks,
12 etc.

13 When a user of a client computer 15 accesses a web page containing
14 streaming media, a conventional web browser of the client computer 15 contacts
15 the web server 12 to request a Hypertext Markup Language (HTML) page. The
16 client-based browser also submits requests to the media server 11 for streaming
17 data, and the annotation server 10 for any annotations associated with the
18 streaming data. When a user of a client computer 15 desires to add or retrieve
19 annotations, the client computer 15 contacts the annotation server 10 to perform
20 the desired addition/retrieval.

21 22 Exemplary Computer Environment

23 In the discussion below, the invention will be described in the general
24 context of computer-executable instructions, such as program modules, being
25 executed by one or more conventional personal computers. Generally, program

modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the invention may be practiced with other computer system configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, network PCs, minicomputers, mainframe computers, and the like. In a distributed computer environment, program modules may be located in both local and remote memory storage devices.

Fig. 2 shows a general example of a computer 20 that can be used as a client or server in accordance with the invention. Computer 20 is shown as an example of a computer that can perform the functions of any of server computers 10-13 or a client computer 15 of Figure 1.

Computer 20 includes one or more processors or processing units 21, a system memory 22, and a bus 23 that couples various system components including the system memory 22 to processors 21.

The bus 23 represents one or more of any of several types of bus structures, including a memory bus or memory controller, a peripheral bus, an accelerated graphics port, and a processor or local bus using any of a variety of bus architectures. The system memory includes read only memory (ROM) 24 and random access memory (RAM) 25. A basic input/output system (BIOS) 26, containing the basic routines that help to transfer information between elements within computer 20, such as during start-up, is stored in ROM 24. Computer 20 further includes a hard disk drive 27 for reading from and writing to a hard disk, not shown, a magnetic disk drive 28 for reading from and writing to a removable magnetic disk 29, and an optical disk drive 30 for reading from or writing to a

1 removable optical disk 31 such as a CD ROM or other optical media. The hard
2 disk drive 27, magnetic disk drive 28, and optical disk drive 30 are connected to
3 the system bus 23 by an SCSI interface 32 or some other appropriate interface.
4 The drives and their associated computer-readable media provide nonvolatile
5 storage of computer readable instructions, data structures, program modules and
6 other data for computer 20. Although the exemplary environment described
7 herein employs a hard disk, a removable magnetic disk 29 and a removable optical
8 disk 31, it should be appreciated by those skilled in the art that other types of
9 computer readable media which can store data that is accessible by a computer,
10 such as magnetic cassettes, flash memory cards, digital video disks, random access
11 memories (RAMs) read only memories (ROM), and the like, may also be used in
12 the exemplary operating environment.

13 A number of program modules may be stored on the hard disk, magnetic
14 disk 29, optical disk 31, ROM 24, or RAM 25, including an operating system 35,
15 one or more application programs 36, other program modules 37, and program
16 data 38. A user may enter commands and information into computer 20 through
17 input devices such as keyboard 40 and pointing device 42. Other input devices
18 (not shown) may include a microphone, joystick, game pad, satellite dish, scanner,
19 or the like. These and other input devices are connected to the processing unit 21
20 through an interface 46 that is coupled to the system bus. A monitor 47 or other
21 type of display device is also connected to the system bus 23 via an interface, such
22 as a video adapter 48. In addition to the monitor, personal computers typically
23 include other peripheral output devices (not shown) such as speakers and printers.

24 Computer 20 operates in a networked environment using logical
25 connections to one or more remote computers, such as a remote computer 49. The

remote computer 49 may be another personal computer, a server, a router, a network PC, a peer device or other common network node, and typically includes many or all of the elements described above relative to computer 20, although only a memory storage device 50 has been illustrated in Fig. 2. The logical connections depicted in Fig. 2 include a local area network (LAN) 51 and a wide area network (WAN) 52. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets, and the Internet. In the described embodiment of the invention, remote computer 49 executes an Internet Web browser program such as the "Internet Explorer" Web browser manufactured and distributed by Microsoft Corporation of Redmond, Washington.

When used in a LAN networking environment, computer 20 is connected to the local network 51 through a network interface or adapter 53. When used in a WAN networking environment, computer 20 typically includes a modem 54 or other means for establishing communications over the wide area network 52, such as the Internet. The modem 54, which may be internal or external, is connected to the system bus 23 via a serial port interface 33. In a networked environment, program modules depicted relative to the personal computer 20, or portions thereof, may be stored in the remote memory storage device. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

Generally, the data processors of computer 20 are programmed by means of instructions stored at different times in the various computer-readable storage media of the computer. Programs and operating systems are typically distributed, for example, on floppy disks or CD-ROMs. From there, they are installed or loaded into the secondary memory of a computer. At execution, they are loaded at

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1 least partially into the computer's primary electronic memory. The invention
2 described herein includes these and other various types of computer-readable
3 storage media when such media contain instructions or programs for implementing
4 the steps described below in conjunction with a microprocessor or other data
5 processor. The invention also includes the computer itself when programmed
6 according to the methods and techniques described below. Furthermore, certain
7 sub-components of the computer may be programmed to perform the functions
8 and steps described below. The invention includes such sub-components when
9 they are programmed as described. In addition, the invention described herein
10 includes data structures, described below, as embodied on various types of
11 memory media.

12 For purposes of illustration, programs and other executable program
13 components such as the operating system are illustrated herein as discrete blocks,
14 although it is recognized that such programs and components reside at various
15 times in different storage components of the computer, and are executed by the
16 data processor(s) of the computer.

17 18 **Client/Server Relationship**

19 Fig. 3 illustrates an exemplary annotation server and client computer in
20 more detail. As noted above, generally, commands are formulated at client
21 computer 15 and forwarded to annotation server 10 via HTTP requests. In the
22 illustrated embodiment of Fig. 3, communication between client 15 and server 10
23 is performed via HTTP, using commands encoded as Uniform Resource Locators
24 (URLs) and data formatted as object linking and embedding (OLE) structured
25 storage documents, or alternatively using Extensible Markup Language (XML).

1 Client 15 runs an HTTP services (HttpSvcs) module 150, which manages
2 communication with server 10, and an annotation back end (ABE) module 151,
3 which translates user actions into commands destined for server 10. A user
4 interface (MMA) module 152 provides the user interface (UI) for a user to add and
5 select different annotations, and be presented with the annotations. According to
6 one implementation, the user interface module 152 supports ActiveX controls that
7 display an annotation interface for streaming video on the Web.

8 Client 15 also executes a web browser module 153, which provides a
9 conventional web browsing interface and capabilities for the user to access various
10 servers via network 16 of Fig. 1. Web browser 153 also provides the interface for
11 a user to select particular media streams for presentation. The user can select
12 which one of different versions of multimedia content he or she wishes to receive
13 from media server 11 of Fig. 1. This selection can be direct (e.g., entry of a
14 particular URL or selection of a "low resolution" option), or indirect (e.g., entry of
15 a particular desired playback duration or an indication of system capabilities, such
16 as "slow system" or "fast system"). Alternatively, other media presentation
17 interfaces could be used.

18 Annotation server 10 includes the Multimedia Annotation Web Server
19 (MAWS) module 130, which is an Internet Services Application Programming
20 Interface (ISAPI) plug-in for Internet Information Server (IIS) module 135 .
21 Together, these two modules provide the web server functionality of annotation
22 server 10. Annotation server 10 also includes an HTTP Services module 131
23 which manages communication with client 15. In addition, annotation server 10
24 utilizes The Windows Messaging Subsystem 134 to facilitate communication with
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1 email server 13 of Fig. 1, and an email reply server 133 for processing incoming
2 email received from email server 13.

3 Annotation server 10 further includes an annotation back end (ABE)
4 module 132, which contains functionality for accessing annotation stores 17 and
5 18, for composing outgoing email based on annotation data, and for processing
6 incoming email. Incoming email is received and passed to the ABE module 132
7 by the Email Reply Server 133. Annotation content authored at client 15, using
8 user interface 152, is received by ABE 132 and maintained in annotation content
9 store 17. Received meta data (control information) corresponding to the
10 annotation content is maintained in annotation meta data store 18. The annotation
11 content and meta data can be stored in any of a variety of conventional manners,
12 such as in SQL relational databases (e.g., using Microsoft "SQL Server" version
13 7.0, available from Microsoft Corporation). Annotation server 10 is illustrated in
14 Fig. 3 as maintaining the annotation content and associated control information
15 (meta data) separately in two different stores. Alternatively, all of the annotation
16 data (content and meta information) can be stored together in a single store, or
17 content may be stored by another distinct storage system on the network 16 of Fig.
18 1, such as a file system, media server, email server, or other data store.

19 Each of the annotations maintained in annotation stores 17 and 18
20 corresponds to each of the different versions of particular multimedia content
21 available to media server 11. Thus, regardless of the number of different versions
22 of particular multimedia content available to media server 11, each annotation
23 created by annotation server 10 is maintained as a single copy corresponding to all
24 of these different versions.
25

Annotation Storage Structure

Fig. 4 shows an exemplary structure for an annotation entry 180 that is maintained by annotation server 10 in annotation meta data store 18 of Fig. 3. In the illustrated example, the annotation entry 180 includes an author field 182, a time range field 184, a time units field 186, a creation time field 188, a title field 190, a content field 192, an identifier field 194, a related annotation identifier field 196, a set identifier(s) field 198, a media content identifier field 200, an arbitrary number of user-defined property fields 202, and a sequence number 204. Each of fields 182-204 is a collection of data which define a particular characteristic of annotation entry 180.

Author field 182 contains data identifying the user who created annotation entry 180 and who is therefore the author of the annotation. The author is identified by ABE 151 of Fig. 3 based on the user logged into client 15 at the time the annotation is created.

Time range field 184 contains data representing "begin" and "end" times defining a segment of media timeline to which annotation entry 180 is associated. Time units field 186 contains data representing the units of time represented in time range field 184. Together, time range field 184 and time units field 186 identify the relative time range of the annotation represented by annotation entry 180. This relative time range corresponds to a particular segment of the media content to which annotation entry 180 is associated. The begin and end times for the annotation are provided by the user via interface 152 of Fig. 3, or alternatively can be automatically or implicitly derived using a variety of audio and video signal processing techniques, such as sentence detection in audio streams or video object tracking.

1 The begin and end times stored in time range field 184 reference the
2 version of the media content being played back when annotation entry 180 was
3 created, or alternatively reference the base version. The media content can have
4 multiple different versions, some of which may have different presentation
5 timelines (as discussed in more detail below). The particular range of another
6 version, for instance the one currently being viewed by a user, to which the
7 annotation corresponds can thus be readily determined based on the time range
8 field 184 and time units field 186, in conjunction with the known relationship
9 among the presentation timeline of the base version, the version being viewed, and
10 the version on which the annotation was originally created.

11 It should be noted that the time ranges for different annotations can overlap.
12 Thus, for example, a first annotation may correspond to a segment ranging
13 between the first and fourth minutes of media content, a second annotation may
14 correspond to a segment ranging between the second and seventh minutes of the
15 media content, and a third annotation may correspond to a segment ranging
16 between the second and third minutes of the media content.

17 Alternatively, rather than using the presentation timeline of the media
18 content, different media characteristics can be used to associate the annotation
19 with a particular segment(s) of the media content. For example, annotations could
20 be associated with (or "anchored" on) specific objects in the video content, or
21 specific events in the audio content.

22 Creation time field 188 contains data specifying the date and time at which
23 annotation entry 180 is created. The time of creation of annotation entry 180 is
24 absolute and is not relative to the video or audio content of the media stream to
25 which annotation entry 180 is associated. Accordingly, a user can specify that

09396706-091599

1 annotations which are particularly old, e.g., created more than two weeks earlier,
2 are not to be displayed. ABE 132 of Fig. 3 stores the creation time and date when
3 the annotation is created.

4 Title field 190 contains data representing a title by which the annotation
5 represented by annotation entry 180 is identified. The title is generally determined
6 by the user and the user enters the data representing the title using conventional
7 and well known user interface techniques. The data can be as simple as ASCII
8 text or as complex as HTML code which can include text having different fonts
9 and type styles, graphics including wallpaper, motion video images, audio, and
10 links to other multimedia documents. The title is also referred to herein as the
11 "subject" or "subject line" for the annotation.

12 Content field 192 contains data representing the substantive content of the
13 annotation as authored by the user. The actual data can be stored in content field
14 192, or alternatively content field 192 may store a pointer to (or other indicator of)
15 the content that is stored separately from the entry 180 itself. In the illustrated
16 example, content field 192 includes a pointer to (or other identifier of) the
17 annotation content, which in turn is stored in annotation content store 17. The user
18 enters the data representing the content using conventional and well known user
19 interface techniques. The content added by the user in creating annotation entry
20 180 can include any one or more of text, graphics, video, audio, etc. or links
21 thereto. In essence, content field 192 contains data representing the substantive
22 content the user wishes to include with the presentation of the corresponding
23 media stream at the relative time range represented by time range field 184 and
24 time units field 186.

1 In one implementation, annotations can be any media type with an
2 associated OLE (object linking and embedding)-compliant viewer or editor,
3 including both accepted versions of the OLE standard and proposed standards for
4 future adoption. OLE specifies the way in which data (e.g., files or portions of
5 files) can be linked to or embedded in another file (or portion of a file). Content
6 field 192 can store the necessary linking and embedding information to link to or
7 embed the data (files, documents, etc.) for the annotation. Further details about
8 OLE are available from Microsoft Corporation of Redmond, Washington.

9 Annotation identifier field 194 stores data that uniquely identifies
10 annotation entry 180, while related annotation identifier field 196 stores data that
11 uniquely identifies a related annotation. Annotation identifier field 194 can be
12 used by other annotation entries to associate such other annotation entries with
13 annotation entry 180. In this way, threads of discussion can develop in which a
14 second annotation responds to a first annotation, a third annotation responds to the
15 second annotation and so on. By way of example, an identifier of the first
16 annotation would be stored in related annotation identifier field 196 of the second
17 annotation, an identifier of the second annotation would be stored in related
18 annotation identifier field 196 of the third annotation, and so on.

19 Set identifier(s) field 198 stores data that identifies one or more sets to
20 which annotation entry 180 belongs.. Media content can have multiple sets of
21 annotations, sets can span multiple media content, and a particular annotation can
22 correspond to one or more of these sets. Which set(s) an annotation belongs to is
23 identified by the author of the annotation. By way of example, media content
24 corresponding to a lecture may include the following sets: "instructor's
25

1 comments", "assistant's comments", "audio comments", "text comments",
2 "student questions", and each student's personal comments.

3 Media content identifier field 200 contains data that uniquely identifies
4 particular multimedia content as the content to which annotation entry 180
5 corresponds. Media content identifier 200 can identify a single media stream
6 (either an individual stream or a composite stream), or alternatively identify
7 multiple different streams that are different versions of the same media content.
8 Media content identifier 200 can identify media versions in a variety of different
9 manners. According to one embodiment, the data represents a real-time transport
10 protocol (RTP) address of the different media streams. An RTP address is a type
11 of uniform resource locator (URL) by which multimedia documents can be
12 identified in a network. According to an alternate embodiment, a unique identifier
13 is assigned to the content rather than to the individual media streams. According
14 to another alternate embodiment, a different unique identifier of the media streams
15 could be created by annotation server 10 of Fig. 3 and assigned to the media
16 streams. Such a unique identifier would also be used by streaming media server
17 11 of Fig. 1 to identify the media streams. According to another alternate
18 embodiment, a uniform resource name (URN) such as those described by K.
19 Sollins and L. Mosinter in "Functional Requirements for Uniform Resource
20 Names," IETF RFC 1733 (December 1994) could be used to identify the media
21 stream.

22 User-defined property fields 202 are one or more user-definable fields that
23 allow users (or user interface designers) to customize the annotation system.
24 Examples of such additional property fields include a "reference URL" property
25 which contains the URL of a web page used as reference material for the content

1 of the annotation; a "help URL" property containing the URL of a help page which
2 can be accessed concerning the content of the annotation; a "view script" property
3 containing JavaScript which is to be executed whenever the annotation is viewed;
4 a "display type" property, which gives the client user interface information about
5 how the annotation is to be displayed; etc.

6 Sequence number 204 allows a user to define (via user interface 152 of Fig.
7 3) a custom ordering for the display of annotation identifiers, as discussed in more
8 detail below. Sequence number 204 stores the relative position of the annotations
9 with respect to one another in the custom ordering, allowing the custom ordering
10 to be saved for future used. In the illustrated example, annotation entry 180 stores
11 a single sequence number. Alternatively, multiple sequence numbers 204 may be
12 included in annotation entry 180 each corresponding to a different custom
13 ordering, or a different annotation set, or a different user, etc.

14 Annotation Positioning

15
16 An annotation can be created by a user of any of the client computers 15 of
17 Fig. 1. When a user is playing back multimedia content he or she can add an
18 annotation to any temporal point or range of the content that he or she desires.
19 Situations can arise, however, where the user does not realize that he or she wants
20 to add an annotation until after the desired temporal point or beginning of the
21 temporal range has passed. For example, a user may desire to add an annotation to
22 a particular segment of a lecture. However, the playback of the lecture may be
23 twenty seconds into the segment (or the segment may be over) before the user
24 realizes that he or she wants to add the annotation. Manually searching back
25

1 through the content to locate the correct temporal point where the annotation
2 should begin can be a difficult and cumbersome process.

3 User interface module 152 of Fig. 3 assists the user in temporally
4 positioning the annotation, including assisting the user in locating the correct or
5 starting point for the annotation. Interface module 152 allows the user to scan
6 back through the multimedia content by identifying the likely beginning points for
7 new ideas or sentences. The user will typically want to set the starting point for an
8 annotation to be the beginning of a sentence or new idea, so interface 152 allows
9 the user to scan back through the multimedia content jumping from likely
10 beginning point to likely beginning point (e.g., by selecting a "rewind" button).
11 Alternatively, interface 152 may simply jump back to the first (or some other
12 predetermined or dynamically determined number) likely beginning point and use
13 that as the starting point for the annotation without requiring user input.

14 Interface module 152 communicates with web browser 153 or other
15 multimedia presentation application that is presenting the multimedia content to
16 access the multimedia content and locate likely beginning points for sentences or
17 new ideas. Interface 152 can also communicate to web browser 153 (or other
18 multimedia presentation application) to present the media content at a particular
19 temporal location (e.g., a likely beginning point). It may also be necessary for
20 interface 152 or web browser 153 to access media server 11 of Fig. 1 to obtain the
21 data for previously-presented portions of the media content.

22 Likely beginning points for new ideas or sentences can be determined using
23 a wide variety of techniques. Any one of these techniques can be used to
24 determine likely beginning points, or alternatively multiple techniques may be
25 combined. One such technique is referred to as "pause detection". In pause

1 detection, the audio content is monitored to identify pauses in the audio
2 presentation. Such pauses are selected as likely beginning points as new sentences
3 or ideas are typically preceded by a pause when the presenter is speaking.

4 Another such technique is referred to as "pitch analysis". In pitch analysis,
5 the audio content is monitored to identify the relative pitch of the presenter's
6 voice. When the presenter is talking about more important ideas or issues the
7 pitch of his or her voice is often higher than when talking about less important
8 ideas or issues. Thus, points where the pitch is higher are likely beginning points
9 for new ideas.

10 Another such technique is to use conventional speech-to-text conversion
11 techniques to convert the audio content to text. Conventional natural language
12 processing techniques can then be used to identify sentence boundaries.

13 Yet another such technique is referred to as video frame analysis, in which
14 the video content is monitored. In one implementation, frames of the video
15 content are monitored for movement. For example, a speaker shown in the video
16 content may move his or her hands a significant amount while speaking, and hold
17 them relatively still during pauses. Thus, breaks between sentences or ideas could
18 be identified by detecting breaks in movement of objects in the video content. By
19 way of another example, any of a variety of conventional object recognition and
20 tracking algorithms could be used to identify and track particular objects. Idea or
21 subject breaks can be identified by detecting when the particular objects are no
22 longer in view, or when they stop moving.

23 Additionally, user interface module 152 can similarly assist users in
24 determining the ending point for an annotation. Situations can arise where the
25 entire temporal range that the annotation should correspond to has been presented



1 before the user selects to add an annotation. Interface module 152 can identify
2 likely ending points in the same manner as likely beginning points are identified,
3 allowing the user to scan back through the multimedia content jumping from likely
4 ending point to likely ending point.

5 Fig. 5 is a flowchart illustrating an exemplary process for assisting a user in
6 determining a starting point for an annotation. The process shown in Fig. 5 is
7 implemented by user interface module 152 of Fig. 3, and may be performed in
8 software. These steps are described with additional reference to Fig. 3.

9 Initially, interface module 152 receives a user request to add a new
10 annotation corresponding to media content being played back (step 222). Upon
11 receipt of the request, interface 152 identifies the temporal location in the media
12 content being presented at the time the request is received (step 224).

13 Interface 152 then accesses the media content (e.g., via web browser 153)
14 and searches temporally back through the media content for a likely beginning
15 point prior to the temporal location identified in step 224 (step 226). An
16 indication of the likely beginning point is provided to the user, such as beginning
17 playback of the media content at the likely beginning point, or presenting a frame
18 of the video content that corresponds to the likely beginning point (step 228).

19 If the user selects the likely beginning point (step 230), such as by actuation
20 of an on-screen button or menu option, then interface 152 uses the selected
21 beginning point as the starting point for the annotation (step 232). Otherwise,
22 interface 152 continues to determine likely beginning points (step 226) and
23 provided indications of the points to the user (step 228), until eventually the user
24 selects one.
25

1 Additionally, the process of Fig. 5 could be used to "scan" forward
2 temporally rather than scan backwards. A user could scan forward to locate an
3 ending point or beginning point for the annotation. For example, if a user were
4 scanning backwards to identify the beginning point, the user may "overshoot" the
5 desired starting point and begin scanning forward.

6 7 User Interface

8 An annotation can be created by a user of any of the client computers 15 of
9 Fig. 1. As discussed above with reference to Fig. 3, client 15 includes an interface
10 module 152 that presents an interface to a user (e.g., a graphical user
11 interface(GUI)), allowing a user to make requests of annotation server 10.
12 Numerous windows, dialog boxes, tool bars, etc. can be displayed to the user by
13 interface module 152, as discussed in more detail below. In the illustrated
14 embodiment, a user can access annotation server 10 via an annotation toolbar
15 provided by interface 152.

16 The interface module 152 is an application program (or part of an
17 application program) that is executed at client 15. The interface module 152 may
18 be incorporated into the web browser, operating system, or run as part of a
19 separate, self-contained application which can be stored locally at client 15 or
20 alternatively received from a remote server (e.g., web page server 12 of Fig. 1) for
21 execution at client 15. In any case, the interface module 152 operates in a
22 graphical user interface windowing environment such as provided by the
23 "Windows" brand of operating systems, available from Microsoft Corporation of
24 Redmond, Washington.

Discussion is made herein of a user selecting or actuating graphical buttons or boxes, selecting menu or list options, etc. The user can perform such selection or actuation via any of a variety of conventional UI actuation mechanisms, such as using a cursor control device to position a pointer over the option or button to be selected or actuated and "clicking" on a button of the cursor control device, by tabbing (or using arrow keys) to the desired option or button and hitting the "enter" key on an alphanumeric keyboard, etc.

Fig. 6 illustrates an annotation toolbar in accordance with one embodiment of the invention. Annotation toolbar 250 includes various identifying information and user-selectable options 252-268. Annotation toolbar 250 can be a stand-alone toolbar (e.g., a separate moveable and resizable window within a graphical user interface), or alternatively can be incorporated as part of another window (e.g., within a multimedia presentation window).

Selection of an exit or "X" button 252 causes interface 152 to terminate display of the toolbar 250. A server identifier 254 identifies the annotation server with which client 15 is currently configured to communicate (annotation server 10 of Fig. 1. in the illustrated embodiment). Selection of icon 256 causes interface 152 to display a drop-down or pull-down menu 258 allowing a user to select another annotation server.

Selection of a connection button 260 causes ABE 151 of Fig. 3 to establish a connection with the annotation server identified by identifier 254. Selection of a query button 262 causes interface module 152 to open a "query" dialog box, from which a user can search for particular annotations. Selection of an add button 264 causes interface module 152 to open an "add new annotation" dialog box, from which a user can create a new annotation.

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1 Selection of a show annotations button 266 causes interface module 152 to
2 open a "view annotations" dialog box, from which a user can select particular
3 annotations for presentation.

4 Selection of a preferences button 268 causes interface 152 of Fig. 3 to open
5 a "preferences" dialog box, from which a user can specify various UI preferences,
6 such as an automatic server query refresh interval, or default query criteria values
7 to be persisted between sessions.

8 Fig. 7 shows an exemplary "add new annotation" dialog box 280 that
9 allows a user to create a new annotation. Dialog box 280 can be presented, for
10 example, in response to user selection of add button 264 of Fig. 6.

11 Dialog box 280 includes an annotation set identifier 282, a subject line 284,
12 and an email field 286. Annotation set identifier 282 allows the user to identify a
13 named set to which the new annotation will belong. This set can be a previously
14 defined set, or a new set being created by the user. Selection of the particular set
15 can be made from a drop-down menu activated by selection of icon 288, or
16 alternatively can be directly input by the user (e.g., typed in using an alphanumeric
17 keyboard). According to one embodiment of the invention, annotation server 10
18 of Fig. 3 supports read and write access controls, allowing the creator of the set to
19 identify which users are able to read and/or write to the annotation set. In this
20 embodiment, only those sets for which the user has write access can be entered as
21 set identifier 282. Alternatively, rather than (or in addition to) user selection of an
22 annotation set, one or more annotation sets may be inherently associated with
23 dialog box 280 (or toolbar 250 of Fig. 6) and thus implicitly selected for each new
24 annotation.
25

Subject line 284 allows the user to provide a short summary or title of the annotation content. Although the subject line is illustrated as being text, it could include any of a wide variety of characters, alphanumerics, graphics, etc. In the illustrated embodiment, subject line 284 is stored in the title field 190 of the annotation entry of Fig. 4.

Email field 286 allows the user to input the email address of a recipient of the annotation. When an email address is included, the newly created annotation is electronically mailed to the recipient indicated in field 286 in addition to being added to the annotation database. Additional information regarding such email messages is also maintained by annotation server 10, such as the recipients of the email messages, the time and date the messages were sent, etc.

Dialog box 280 further includes an annotation type selector in the form of radio buttons 290, 292, and 294, selection of which creates text annotation, an audio annotation, or a uniform resource locator (URL) annotation, respectively. Although not shown, other types of annotations could also be accommodated, such as graphics, video, etc. The content of the annotation is input to annotation field 296, which is text in the illustrated example of Fig. 7.

Dialog box 280 also includes a checkbox 298 that allows the user to create an anonymous annotation. When checkbox 298 is selected (as illustrated in Fig. 7), the author of the annotation is not stored in author field 182 of Fig. 4. Annotation backend 151 can simply not forward the author information to annotation server 10 of Fig. 3, or alternatively annotation server 10 may simply ignore the author information.

Interface 152 assumes that the current media stream being presented to the user is the media stream to which the new annotation will be associated. The

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1 media stream to which an annotation is associated is referred to as the "target" of
2 the annotation. An identifier of this stream is displayed in a target specification
3 area 300 of dialog box 280. Alternatively, a user could change the target of the
4 annotation, such as by typing in a new identifier in target area 300, or by selection
5 of a "browse" button (not shown) that allows the user to browse through different
6 directories of media streams.

7 A time strip 302 is also provided as part of dialog box 280. Time strip 302
8 represents the entire presentation time of the corresponding media stream. A
9 "thumb" 304 that moves within time strip 302 indicates a particular temporal
10 position within the media stream. The annotation being created via dialog box 280
11 has a begin time and an end time, which together define a particular segment of
12 the media stream. This segment is illustrated as darkened portion 306 of time strip
13 302. When "from" button 308 is selected, thumb 304 represents the begin time for
14 the segment relative to the media stream. When "to" button 310 is selected, thumb
15 304 represents the end time for the segment relative to the media stream.
16 Alternatively, two different time bars could be displayed, one for the begin time
17 and one for the end time. The begin and end times are also displayed in an
18 hours/minutes/seconds format in boxes 312 and 314, respectively.

19 Thumb 304 can be moved along time strip 302 in any of a variety of
20 conventional manners. For example, a user can depress a button of a mouse (or
21 other cursor control device) while a pointer is "on top" of thumb 304 and move the
22 pointer along time strip 302, causing thumb 304 to move along with the pointer.
23 The appropriate begin or end time is then set when the mouse button is released.
24 Alternatively, the begin and end times can be set by entering (e.g., via an
25 alphanumeric keyboard) particular times in boxes 312 and 314.

1 In one implementation, interface module 152 assists the user in locating a
2 beginning point and/or an ending point for the annotation using thumb 304. In this
3 implementation, interface module 152 determines likely beginning and/or ending
4 points as the user moves thumb 304 along time strip 302 and causes thumb 304 to
5 move to positions in time strip 302 from likely beginning (or ending) point to
6 likely beginning (or ending) point. Thus, interface module 152 causes thumb 304
7 to move along in a "jumping" manner, limiting the locations along time strip 302
8 where thumb 304 can be placed. For each likely beginning (or ending) point,
9 interface module 152 also updates box 312 and/or 314 with the presentation time
10 at that point, and also forwards a request to web browser 153 (or other multimedia
11 presentation application) to display the frame of video content at that point.

12 Dialog box 280 also includes a "play" button 316. Selection of play button
13 316 causes interface module 152 of Fig. 3 to forward a segment specification to
14 web browser 153 of client 15. The segment specification includes the target
15 identifier from target display 300 and the begin and end times from boxes 312 and
16 314, respectively. Upon receipt of the segment specification from interface
17 module 152, the browser communicates with media server 11 and requests the
18 identified media segment using conventional HTTP requests. In response, media
19 server 11 streams the media segment to client 15 for presentation to the user. This
20 presentation allows, for example, the user to verify the portion of the media stream
21 to which his or her annotation will correspond.

22 Dialog box 280 also includes a cancel button 318, an OK button 320, and
23 an advanced button 322. Selection of cancel button 318 causes interface 152 to
24 close the dialog box 280, canceling out of the add new annotation process.
25 Selection of OK button 320 causes interface 152 to forward the information

1 entered in dialog box 280 to annotation backend 151, which sends the new
2 annotation information to annotation server 10 of Fig. 3. Interface 152 then closes
3 dialog box 280, the new annotation being entered.

4 Selection of "advanced" button 322 causes interface 152 to display a
5 different dialog box for adding new annotations which reduces the number of
6 options available to the user. The reduced option dialog box is discussed in more
7 detail below with reference to Fig. 8. The advanced button included in many of
8 the button dialog boxes described herein operates as a toggle button between a
9 full-option dialog box (e.g., for advanced users) and a reduced option dialog box
10 (e.g., for novice users).

11 Fig. 8 shows another exemplary "add new annotation" dialog box 330.
12 Dialog box 330 is similar to dialog box 280 of Fig. 7, but is a reduced option box.
13 As illustrated, dialog box 330 includes much of the same information and fields as
14 dialog box 280 of Fig. 7. However, the target stream information and begin and
15 end time information for the annotation is not included (e.g., fields 300 – 316 of
16 Fig. 7 are not included in dialog box 330).

17 By reducing the options and information available in dialog box 330, a
18 more simplified dialog box for adding annotations is displayed to the user. Dialog
19 box 330 also includes an advanced button 332, selection of which causes interface
20 152 to display dialog box 280 of Fig. 7 (which includes the additional options and
21 information). When switching between the full option dialog box 280 of Fig. 7
22 and the reduced option dialog box 330 of Fig. 8, any information entered by the
23 user in one dialog box is displayed in the corresponding field in the other dialog
24 box (assuming such a field is displayed in the other dialog box).

Fig. 9 shows another exemplary "add new annotation" dialog box 340. Dialog box 340 is similar to dialog box 330 of Fig. 8, except that dialog box 340 is for adding an audio annotation rather than a text annotation. As illustrated, radio button 292 is selected for audio data rather than radio button 290. Dialog box 340 includes input controls 342 and an audio display bar 279. Input controls 342 include conventional audio control buttons such as fast forward, rewind, play, pause, stop and record. Selection of the various individual control buttons allows the user to record, playback, erase, etc. the audio input he or she desires to be the annotation content. Audio display bar 344 provides visual progress feedback when the audio is playing or recording, indicating how much of the recorded audio has been played back or recorded.

Fig. 10 shows another exemplary "add new annotation" dialog box 350. Dialog box 350 is similar to dialog box 330 of Fig. 8, except that dialog box 350 is for adding an URL annotation rather than a text annotation. As illustrated, radio button 294 is selected for an URL annotation rather than radio button 290. Dialog box 350 includes an annotation field 352 into which the content of the annotation (an URL) can be entered by the user (e.g., by typing on an alphanumeric keyboard).

Fig. 11 shows another exemplary "add new annotation" dialog box 360. Dialog box 360 includes much of the same information and fields for an audio annotation as dialog box 280 of Fig. 7 and dialog box 340 of Fig. 9. However, the information and fields are arranged differently in dialog box 360. Fig. 12 shows a "query annotations" dialog box 370 that results from a user selecting query button 262 of Fig. 6. Many of the options and fields presented to the user in dialog box 370 are similar to those presented in the "add new annotation" dialog box 280 of

1 Fig. 7, however, those in dialog box 370 are used as search criteria rather than data
2 for a new annotation.

3 Dialog box 370 includes a target display 372 that contains an identifier of
4 the target stream. This identifier can be input in any of a variety of manners, such
5 as by typing in a new identifier in target display 372, or by selection of a "browse"
6 button (not shown) that allows the user to browse through different directories of
7 media streams. In the illustrated embodiment, the identifier is an URL. However,
8 alternate embodiments can use different identifier formats.

9 Dialog box 370 also includes target information 374, which includes a time
10 strip, thumb, "from" button, "to" button, "play" button, and begin and end times,
11 which are analogous to the time strip, thumb, "from" button, "to" button, "play"
12 button, begin and end times of dialog box 280 of Fig. 7. The begin and end times
13 in target information 374 limit the query for annotations to only those annotations
14 having a time range that corresponds to at least part of the media segment between
15 the begin and end times of target information 374.

16 Dialog box 370 also includes an annotation set list 376. Annotation set list
17 376 includes a listing of the various sets that correspond to the target media
18 stream. According to one implementation, only those sets for which an annotation
19 has been created are displayed in set list 376. According to one embodiment of
20 the invention, annotation server 10 of Fig. 3 supports read and write security,
21 allowing the creator of the set to identify which users are able to read and/or write
22 to the annotation set. In this embodiment, only those sets for which the user has
23 read access are displayed in set list 376.

24 A user can select sets from annotation set list 376 in a variety of manners.
25 For example, using a mouse and pointer to "click" on a set in list 376, which

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1 highlights the set to provide feedback to the user that the set has been selected.
2 Clicking on the selected set again de-selects the set (leaving it no longer
3 highlighted). Additionally, a "select all" button 378 allows a user to select all sets
4 in set list 376, while a "deselect all" button 380 allows a user to de-select all sets
5 in set list 376.

6 Alternatively, rather than (or in addition to) user selection of an annotation
7 set, one or more annotation sets may be inherently associated with dialog box 370
8 and thus implicitly selected for each new annotation.

9 In the illustrated embodiment, the sets displayed as part of annotation set
10 list 376 contain annotations which correspond to the target identifier in target
11 display 372. However, in alternate embodiments the sets in list 376 need not
12 necessarily contain annotations which correspond to the target identifier in target
13 display 372. Interface module 152 allows a user to select different target streams
14 during the querying process. Thus, a user may identify a first target stream and
15 select one or more sets to query annotations from for the first target stream, and
16 then identify a second target stream and select one or more sets to query
17 annotations from for the second target stream.

18 Additional search criteria can also be input by the user. As illustrated,
19 fields 382 and 384 allow a particular creation date and time identifier to be input
20 along with a temporal relation (e.g., "after" or "before"). Similarly, a summary
21 keyword search field 386 allows particular words, phrases, characters, graphics,
22 etc. that must appear in the summary (or subject, title, annotation content, etc.) to
23 be input. A maximum number of annotations to retrieve in response to the query
24 can also be selected in maximum field 388. Furthermore, the query can be limited
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1 to only annotations that correspond to the target identifier in target display 372 by
2 selecting check box 389.

3 A level of detail 390 to retrieve can also be selected by the user. Examples
4 of different levels that could be retrieved include the "full level" (that is, all
5 content of the annotation), or a "deferred download" where only an identifier of
6 the annotations (e.g., a summary or title) is downloaded. In the illustrated
7 example, selection of checkbox 394 selects the deferred download level, whereas
8 if checkbox 394 is not selected then the full level of detail is implicitly selected.

9 A server identifier 396 identifies the annotation server with which client 15
10 is currently configured to communicate. Different annotation servers can be
11 selected by the user by inputting the appropriate identifier as server identifier 396.
12 This input can be provided in any of a variety of manners, such as by typing in a
13 new identifier in server identifier 396 or by selection of a "browse" button (not
14 shown) that allows the user to browse through different directories of annotation
15 servers.

16 A user can request automatic display of the retrieved annotations by
17 selecting a "display retrieved annotations" checkbox 398. Selection of
18 "advanced" button 402 reduces the number of options available to the user,
19 simplifying dialog box 370. The reduced option dialog box is discussed in more
20 detail below with reference to Fig. 13.

21 The user can cancel out of the query process at any time by selecting cancel
22 button 404. The user can then complete the query process by selecting a query
23 button 404. Upon selection of the query button 406, interface 152 closes the query
24 dialog box 370 and forwards the search criteria to annotation server 10.
25

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1 Additionally, if checkbox 398 is selected then interface 152 displays a "view
2 annotations" dialog, as discussed in more detail below.

3 Fig. 13 shows another exemplary "query annotations" dialog box 410.
4 Dialog box 410 is similar to dialog box 370 of Fig. 12, but is a reduced option box.
5 As illustrated, dialog box 410 includes much of the same information and fields as
6 dialog box 370 of Fig. 12. However, the target stream information, and begin and
7 end time information for the annotation, and additional search criteria are not
8 included in dialog box 410.

9 By reducing the options and information available in dialog box 410, a
10 more simplified dialog box for querying annotations is displayed to the user.
11 Dialog box 410 also includes an advanced button 412, selection of which causes
12 interface 152 to display dialog box 370 of Fig. 12, which includes the additional
13 fields and information. When switching between the full option dialog box 370 of
14 Fig. 12 and the reduced option dialog box 410 of Fig. 13, any information entered
15 by the user in one dialog box is displayed in the corresponding field in the other
16 dialog box (assuming such a field is displayed in the other dialog box).

17 Fig. 14 shows another exemplary "query annotations" dialog box 420.
18 Dialog box 420 includes much of the same information and fields for querying
19 annotations as dialog box 370 of Fig. 12. However, the information and fields are
20 arranged differently in dialog box 420.

21 In dialog box 420, a level of detail 422 to retrieve can be selected by the
22 user. Different levels can be selected from a drop-down or pull-down menu by
23 selecting icon 424. Examples of different levels that could be retrieved include the
24 "full level" (that is, all content of the annotation), a "summary only" level, a "user
25

1 identifier only" level, a "preview" level including only the first 512 bytes of data,
2 etc.

3 Additionally, annotation sets are displayed in a different manner in dialog
4 box 420 than in dialog box 370 of Fig. 12. Dialog box 420 includes an annotation
5 set list 426 and an annotation set selection list 428. Annotation set list 426
6 includes a listing of the various sets that correspond to the target media stream.
7 According to one implementation, only those sets for which an annotation has
8 been created are displayed in set list 426. According to one embodiment of the
9 invention, annotation server 10 of Fig. 3 supports read and write security, allowing
10 the creator of the set to identify which users are able to read and/or write to the
11 annotation set. In this embodiment, only those sets for which the user has read
12 access are displayed in selection list 426.

13 A user can select sets from annotation set list 426 to create selection list
14 428. Selection list 428 identifies the sets that will be searched when the query
15 input process is complete. Sets can be moved between set list 426 and selection
16 list 428 in a variety of manners. For example, using a mouse and pointer to
17 "click" on a set in list 426 (which may also highlight the set) and then clicking on
18 a right arrow button 430 would cause interface 152 to add that set to selection list
19 428. Similarly, clicking on a set in selection list 428 and then clicking on a left
20 arrow button 432 would cause interface 152 to remove that set from selection list
21 428. By way of additional examples, sets may be moved from one list to another
22 in a "drag and drop" manner, or by simply single-clicking or double-clicking on
23 the appropriate set.

24 Fig. 15 shows a dialog box 440 that identifies annotations corresponding to
25 one or more annotation sets. The identified annotations are the result of the query

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1 input by the user as discussed above with reference to Figs. 12 – 14, or
2 alternatively by selection of show annotations button 266 of Fig. 6. In the
3 illustration of Fig. 15, annotation identifiers in form of user identifiers 442 and
4 subject lines 444 are displayed within an annotation listing box 446. The user can
5 scroll through annotation identifiers in a conventional manner via scroll bars 448
6 and 450. The annotation identifiers are presented in annotation listing box 446
7 according to a default criteria, such as chronological by creation time/date, by
8 user, alphabetical by summaries, etc. Icons identifying the type of annotation are
9 also displayed in listing box 446, such as a circle 445 to represent text and a
10 microphone 447 to represent audio.

11 Related annotations are displayed in an annotation listing 446 in a
12 hierarchical, horizontally offset manner. The identifier of an annotation that is
13 related to a previous annotation is “indented” from that previous annotation’s
14 identifier and a connecting line between the two identifiers is shown. For
15 example, the annotations identified by identifiers 452 and 454 are both related to
16 the previous annotation identified by identifier 456. Expansion icons 458 are used
17 to allow the user to display the identifiers of related annotations, while reduction
18 icons 460 are used to allow the user to hide the identifiers of related applications.
19 For example, an expansion icon 458 indicates to the user that additional related
20 annotations exist for the annotation identified by identifier 462.

21 By selecting a particular annotation identifier from annotation listing 446
22 (e.g., “single clicking” on the summary using the left mouse button), preview
23 information is presented in a preview section 464, and a selection box or menu
24 466 is provided. The exact nature of the preview information is dependent on the
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1 amount of information that was requested (e.g., as identified in level of detail 422
2 of Fig. 14).

3 Selection box 466 provides various user-selectable features related to the
4 annotation whose identifier is selected, including "seek", "reply", "open",
5 "delete", and "edit". Selection of the "seek" feature causes interface module 152
6 of Fig. 3 to initiate presentation of the media segment corresponding to the
7 annotation (analogous to the play button 316 of Fig. 7 discussed above). Selection
8 of the "reply" feature allows the user to create a new annotation that is related to
9 the selected annotation. The new annotation will be displayed offset horizontally
10 from the selected annotation, analogous to annotations 452 and 456 discussed
11 above.

12 Selection of the "open" feature causes interface module 152 of Fig. 3 to
13 request all of the annotation content for the selected annotation from annotation
14 server 10. Selection of the "delete" feature causes interface module 152 to remove
15 the selected annotation from annotation listing 446. In one embodiment, removal
16 of a particular annotation also causes removal of all related annotations (e.g.,
17 deleting the annotation identified by identifier 456 would also cause deletion of
18 the annotations identified by identifiers 452 and 454). Selection of the "edit"
19 feature causes interface module 152 to display another dialog box allowing the
20 user to edit the content of the annotation, as discussed in more detail below. When
21 enabled, selection of the "export" feature (which is shadowed and thus not enabled
22 in the illustrated example) causes interface module 152 to display a "file save"
23 dialog box via which the user could save the annotation as a word processing
24 document (e.g., as a Microsoft Word word processing document). This saved
25

28

1 Selection of close button 476 causes interface 152 to terminate the display
2 of dialog box 440. Selection of advanced button 478 causes interface 152 to
3 display a different view annotations box having additional details, as discussed in
4 more detail below with reference to Fig. 16.

5 Fig. 16 shows another exemplary "view annotations" dialog box 490.
6 Dialog box 490 includes much of the same information for viewing annotations as
7 dialog box 440 of Fig. 15. However, the information is arranged differently in
8 dialog box 490, and additional information and options are also displayed. When
9 switching between the full option dialog box 490 of Fig. 16 and the reduced option
10 dialog box 440 of Fig. 15, any information entered by the user in one dialog box is
11 displayed in the corresponding field in the other dialog box (assuming such a field
12 is displayed in the other dialog box).

13 The additional information displayed in dialog box 490 includes summary
14 preferences 492, target preferences 494, and an annotation target identifier 496.
15 Summary preferences 492 allow a user to select the identifying information he or
16 she would like included in annotation list 446. Summary preferences 492 include
17 checkboxes allowing the user to select to show the author, the annotation set, the
18 creation date, the annotation subject, or any combination thereof. Annotation
19 target identifier 496 identifies the target multimedia content for the annotations
20 listed in annotation list 446.

21 Target preferences 494 include seek options 498 and checkbox 500. Seek
22 options 498 allow the user to select from various options the resultant behavior
23 from seeking to an annotation (e.g., by selecting "seek" in menu 466 of Fig. 15).
24 Additional options can be selected via a drop-down or pull-down menu by
25 actuating icon 502. Examples of options include: "seek and play to end", which

1 initiates playback of the multimedia content at the temporal position
2 corresponding to the begin time of the annotation and continuing until the end of
3 the multimedia content; "seek and play annotation", which plays back only the
4 temporal segment of the multimedia content identified by the begin and end times
5 of the annotation; "seek and skip to next", which plays the temporal segment of
6 the multimedia content identified by the begin and end times of the annotation,
7 then jumps to play the temporal segment of the next annotation in annotation
8 listing 446 (and continually jumping to the next temporal segment when the
9 current temporal segment end time is reached).

10 Dialog box 490 also includes an advanced button 504, which causes
11 interface module 152 to display a view annotations dialog box having less
12 information and/or options, such as dialog box 440 of Fig. 15.

13 Fig. 17 shows another exemplary "view annotations" dialog box 520.
14 Dialog box 520 includes much of the same information for viewing annotations as
15 dialog box 440 of Fig. 15. However, interface module 152 has disabled the merge
16 annotation sets 472 (which causes interface module 152 to re-render the
17 annotations so that the annotations from the same set are displayed grouped
18 together under a tree item with the name of the set as its title, such as "Student
19 Discussion") and track annotations 470 options. Additionally, menu 522 includes
20 different options than those included in menu 466 of Fig. 15. Specifically, menu
21 522 includes a "navigate" option rather than a "seek" option. The "navigate"
22 option is similar to the "seek" option discussed above in menu 466, however the
23 "navigate" option is used when the annotation does not correspond to the current
24 media content being targeted by client 15 (Fig. 3). Selection of the "navigate"
25 option causes user interface module 152 to instruct web browser 153 to navigate to

1 the media content to which the annotation corresponds, making that the current
2 targeted media content.

3 Fig. 18 shows another exemplary "view annotations" dialog box 530.
4 Dialog box 530 includes much of the same information for viewing annotations as
5 dialog box 440 of Fig. 15. However, interface module 152 has disabled the track
6 annotations 470 option, and menu 532 includes different options than those
7 included in menu 466 of Fig. 15. Menu 532 is displayed rather than menu 466 of
8 Fig. 15 or menu 522 of Fig. 17 when an identifier 534 of an annotation set is
9 selected from list 446 rather than an annotation, and the "merge annotation sets"
10 checkbox 472 of (Fig. 15, 16, or 17) is unchecked.

11 Menu 532 includes the following options: play, export ASX playlist,
12 export annotations, time order, custom order, save, and reset. Selection of the play
13 option causes playback of the multimedia content to begin starting with the
14 selected annotation in annotation list 446. Selection of the "export ASX playlist"
15 option causes annotation backend 151 to output a record (e.g., create a file) that
16 identifies the temporal segments of multimedia content that the annotations
17 identified in list 446 correspond to, as determined by the begin and end times of
18 the annotations. Selection of the "export annotations" option causes annotation
19 backend 151 to output a record (e.g., create a file) that includes the annotation
20 content of each annotation identified in list 446.

21 Selection of the "time order" option causes interface module 152 to display
22 the identifiers in list 446 in chronological order based on the begin time for each
23 annotation. Selection of the "custom order" option allows the user to identify
24 some other criteria to be used in determining the order of the identifiers in list 446
25 (e.g., identifiers can be re-ordered in a conventional drag and drop manner). Re-

ordering annotation identifiers causes the sequence numbers 204 (of Fig. 4) of the annotations to be re-ordered accordingly. Selection of the "save" option causes interface module 152 to save the current custom ordering to annotation server 10 of Fig. 3 by saving the current sequence numbers of the annotations. Selection of the "reset" option causes interface module 152 to ignore any changes that have been made since the last saved custom ordering and revert to the last saved custom ordering.

Fig. 19 illustrates an exemplary "reply to annotation" dialog box 550. Reply to annotation dialog box 550 is displayed in response to a user request to create another new annotation by replying to a previous annotation, such as selection of the "reply" option in menu 466 of Fig. 15. Dialog box 550 includes information and fields for adding a new annotation, analogous to dialog box 330 of Fig. 8.

Fig. 20 illustrates an exemplary "view annotation" dialog box 560. View annotation dialog box 560 is displayed in response to a user request to open an individual annotation, such as by selection of the "open" option in menu 466 of Fig. 15.

Dialog box 560 includes the set information 562 for the annotation. Identifiers of other sets that the annotation corresponds to can be viewed by selecting icon 564. Dialog box 560 also includes a subject 566 of the annotation as well as which email recipients 568 the annotation was sent to. The content of the annotation is displayed in content area 570.

Dialog box 560 also includes an advanced button 572 and close button 574. Advanced button 572 provides additional information regarding the annotation, such as an identifier of the corresponding media content, a display of the temporal

range of the media content that the annotation corresponds to, etc. Close button 574 causes interface module 152 to terminate display of dialog box 560.

Fig. 21 illustrates an exemplary "edit annotation" dialog box 590. Edit annotation dialog box 590 is displayed in response to a user request to edit an annotation, such as selection of the "edit" option in menu 466 of Fig. 15. Dialog box 590 includes information and fields displaying the current information for the annotation, analogous to dialog box 560 of Fig. 20. New information can be entered into the fields, analogous to add annotation dialog box 330 of Fig. 8. In the illustrated example, existing email addresses cannot be altered and new email addresses cannot be entered.

Fig. 22 illustrates an exemplary graphical user interface window 610 that concurrently displays annotations and corresponding multimedia content. Window 610 includes a media portion 612, an annotation content portion 614, an annotation identifier portion 616, an annotation preview portion 617, and command bars 618.

Media portion 612 includes a media screen 626, shuttle and volume controls 628 and content information space 630. Media screen 626 is the area within which visual content of the multimedia content is rendered. For non-visual content, screen 626 can display static or dynamic images representing the content, or alternatively be left blank or simply not included in window 610. Shuttle and volume controls 628 are included to allow the user to playback, pause, stop, fast forward, rewind the multimedia presentation, as well as to alter the volume of the multimedia presentation. Content information space 630 lists information pertaining to the multimedia presentation being rendered on screen 626, such as the tracking/timing data for the presentation.

1 Annotation content portion 614 is the region of window 610 within which
2 visual annotations are rendered. For video, graphical, and text annotations, the
3 video, graphical, or text content of the annotation is displayed on screen 614. For
4 non-visual annotations, portion 614 can display static or dynamic images
5 representing the annotation content, or alternatively can be left blank or simply not
6 included in window 610. In the illustrated example, portion 614 displays slides
7 that correspond to the visual content displayed in media portion 612, each slide
8 being a URL annotation. Each such URL annotation contains a URL to one of the
9 slides, and previewing the annotation causes the preview window to navigate to
10 the URL, thus displaying the slide.

11 Annotation identifier portion 616 is the region of window 610 within which
12 identifiers for the annotations are displayed, analogous to Figs. 15 – 18 above.
13 Additional buttons 632 identify different annotation sets that correspond to the
14 multimedia content being presented in media portion 612. In the illustrated
15 example, three different annotation sets are included (the “contents” set, the
16 “questions” set, and the “notes” set). User selection of a button 632 causes
17 interface module 152 to display the annotation identifiers for annotations in the set
18 corresponding to the selected button. One of the buttons 632 is highlighted or
19 otherwise identified as the current set being referenced in portion 616, which is the
20 “questions” annotation set in the illustrated example.

21 Annotation preview portion 617 is a preview window for the annotations
22 identified in portion 616. Visual content (if any) of whatever annotation is
23 selected or tracked in portion 616 is displayed in preview portion 617 (analogous
24 to preview section 464 of Fig. 15).
25

1 Portion 616 also includes add annotation buttons 634 and 636. One or
2 more annotation sets are inherently associated with each of the annotation buttons
3 634 and 636, so selection of one of buttons 634 or 636 causes interface 152 to
4 display an "add new annotation" dialog box (e.g., one from Figs. 7 – 11) with the
5 annotation set automatically set. Alternatively, an "add new annotation" dialog
6 box may be displayed that includes no entry for annotation set identification. In
7 the illustrated example, the "New Public Question" button 634 is associated with
8 the "questions" annotation set, while the "New Private Note" button 636 is
9 associated with the "notes" annotation set.

10 Command bars 618 list familiar UI and web browsing commands, such as
11 "File", "Edit", "Print", URLs, etc.

12 A user can browse through the visual content of media portion 612 using
13 shuttle controls 628 or by moving "thumb" 638 along slider bar 640, which
14 automatically synchronizes the display of the slides in annotation content 614 and
15 the identifiers in annotation identifier portion 616 with the current seek point in
16 the video. Alternatively, double-clicking on or "seeking" to any of the annotations
17 (via the identifiers in annotation identifier portion 616) can be used as a
18 navigational tool as well.

19 Fig. 23 illustrates another exemplary graphical user interface window 650
20 that concurrently displays annotations and corresponding multimedia content.
21 Window 650 is similar to window 610 of Fig. 22 and includes much of the same
22 information and screens.

23 However, window 650 illustrates the "contents" annotation set being
24 illustrated in portion 616, and the "contents" button being identified as the current
25 set being referenced in portion 616.

1 Additionally, interface module 152 of Fig. 3 can communicate with the web
2 browser 153 or other multimedia presentation application. In the illustrated
3 example of Fig. 23, the annotation being displayed in portion 614 is another video
4 presentation (of which only one frame is shown in Fig. 23). When interface
5 module 152 begins displaying the video presentation in portion 614, it sends a
6 pause request to the multimedia presentation application to pause the presentation
7 of the multimedia content. Thus, as illustrated in Fig. 23, the multimedia
8 presentation on screen 626 is paused. When the annotation video presentation is
9 completed (or stopped by the user) interface module 152 sends a play request to
10 the multimedia presentation application to resume presentation of the multimedia
11 content.

12 Fig. 24 illustrates an exemplary customized graphical user interface
13 window 670. Window 670 includes command bars 618, annotation identifier
14 portion 672, configurable buttons 674, and annotation content portion 676.
15 Command bars 618 list familiar UI and web browsing commands as discussed
16 above with reference to Fig. 23.

17 Identifiers of the annotations corresponding to the target multimedia
18 content are displayed in annotation identifier portion 672, analogous to Figs. 15 –
19 18 discussed above. Visual content of an annotation identified by an annotation
20 identifier selected in portion 672 is displayed in annotation content portion 676.

21 Configurable buttons 674 are user-configurable buttons that can be
22 configured by the user to carry out any of a wide variety of actions that he or she
23 desires. In the illustrated example, window 670 is intended to be used as an
24 “observation” window via which an individual observing another individual’s
25 behavior (e.g., during software testing) can enter comments and notes for later use.

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1 However, in window 690 a new annotation is being entered with the
2 annotation content being input in content portion 676. Interface module 152 also
3 provides an email field 692 via which the user can input an email address of a
4 recipient(s) for the new annotation. Once the user has finished entering the new
5 annotation content and email addresses, the user can select the add button 694 to
6 forward the annotation to annotation server 10 of Fig. 3, thereby adding the new
7 annotation to the database. Alternatively, the user can cancel out of the add
8 annotation process by selecting cancel button 696, which causes interface module
9 152 to clear the annotation content portion 676 and the email field 692.

10 Fig. 26 illustrates another exemplary customizable graphical user interface
11 window 710. Window 710 is similar to window 690 of Fig. 25 and includes much
12 of the same information and buttons. However, Fig. 26 also illustrates a menu 712
13 that can be displayed by user selection of one of the buttons (e.g., "right clicking"
14 on the button). In the illustrated example, menu 712 is displayed in response to
15 the user right-clicking on button4.

16 Menu 712 provides three options, including "change button name",
17 "change subject line", and "change body text". The user can change the name of
18 the button as displayed in window 710 by selecting the "change button name"
19 option. Similarly, the user can change the subject line of a new annotation that is
20 created when the button is selected by selecting the "change subject line" option.
21 Similarly, the user can change the annotation content of the new annotation that is
22 created when the button is selected by selecting the "change body text" option.
23
24
25

1 **Conclusion**

2 The invention presents a user-friendly interface for creating and viewing
3 annotations corresponding to multimedia presentations. The user interface
4 advantageously facilitates user creation of new annotations and subsequent user
5 viewing of annotations. Additionally, in one implementation the interface
6 advantageously assists the user in determining the temporal positioning of new
7 annotations.

8 Although the invention has been described in language specific to structural
9 features and/or methodological steps, it is to be understood that the invention
10 defined in the appended claims is not necessarily limited to the specific features or
11 steps described. Rather, the specific features and steps are disclosed as preferred
12 forms of implementing the claimed invention.

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